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16. Abstract

Three fully reversed cyclic structural tests were conducted at roughly 1/5 scale in order to investigate the in-plane web crushing capacity of reinforced concrete structural walls with confined boundary elements. These tests constitute the third phase in a three phase investigation of the seismic performance of hollow rectangular reinforced concrete bridge piers with highly-confined corner elements. Phases I and II investigated in general the flexural and shear behavior of similar structural wall subassemblies and were reported under separate cover {Hines et al.'99}. The three test units were designed to have high flexural strengths and minimal wall thicknesses with average shear stress demands ranging from 12.4 $\sqrt{f'_c}$ to 20.3 $\sqrt{f'_c}$ (psi). All three test units had identical boundary elements but differed geometrically in the depth of the structural wall between the boundary elements. Thus the effect of wall depth and boundary element depth on web crushing was explored.

This report explains the motivation for and the design of the Phase III tests. Test predictions are given with a brief explanation of relevant analytical and material models. Test observations are reported and selected test results are discussed. The experimental web crushing capacities of the test units are compared to the predicted capacities. The contributions of the transverse reinforcement and spirals to the shear resistance of the tension boundary element are discussed. The required development length of the transverse bars in the tension boundary elements is discussed.

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